

Claims:

Amend all of the claims 1-20 as follows:

Claim 1 (currently amended): A multiple-input multiple-output (MIMO)-based multiuser orthogonal frequency division multiplex (OFDM) multiband of ultra wideband (UWB) base station communication transmitter comprising:

~~a multiuser encoding and spreading unit;~~

~~a polyphase-based multiband;~~

~~an IFFT unit;~~

~~a filtering and spreading unit;~~

~~a MIMO-based multiband modulation and multicarrier RF unit; and~~

~~a multiple antenna unit.~~

p user bitstream coupled to p convolution encoders, where p is an integer and greater than 1;

said p convolution encoders coupled to p interleavers;

p outputs of said p interleavers spread out by p user keys to form an encoded sequence by a sum over a block;

each of said p user keys is a unique and orthogonal each other;

said sum over a block coupled to a polyphase-based multiband;

said polyphase-based multiband coupled to k serial-to-parallel (S/P), where k is an integer and greater than 1;

said k S/P coupled to k inverse fast Fourier transforms (IFFTs);

said k IFFTs coupled to k guards;

said k guards coupled to k filtering and spreading units;

said k filtering and spreading units coupled to a MIMO-based multiband and multicarrier radio frequency (RF) unit; and

said MIMO-based multiband and multicarrier RF unit coupled to k antennas.

Claim 2 (currently amended): The MIMO-based multiuser OFDM multiband of UWB base station communication transmitter of claim 1 wherein said polyphase-based multiband includes a random access memory (RAM) memory bank with a length size of N for storing serial input data and P RAM ~~memory~~ banks with a length size of N/P for storing parallel output data, where N , and P are integers and greater than 1, N is greater than P , and N/P is an integer.

Claim 3 (currently amended): The MIMO-based multiuser OFDM multiband of UWB base station communication transmitter of claim 2 wherein polyphase-based multiband ~~[[may]]~~ can produce P parallel data sequences with a data rate of N/P from a serial data sequence with a data rate of N , where N , and P are integers and greater than 1, N is greater than P , and N/P is an integer.

Claim 4 (currently amended): The MIMO-based multiuser OFDM multiband of UWB base station communication transmitter of claim 1 wherein each of said k filtering and spreading units further comprises: a dual switch, a multiband spreading, two XOR, two transmitter shaped

~~filters, two D/A converters, and two analog reconstruction filters.~~

a dual-switch with N inputs and two outputs,
where N is an integer and greater than 1;
said two outputs of the dual-switch spread out by
a multiband spreading via two exclusive-OR (XOR) modules;
said two XOR modules coupled to two transmitter
shaped filters followed by two digital-to-analog (D/A)
converters; and
said two D/A converters coupled to two analog
reconstruction filters.

Claim 5 (currently amended): The MIMO-based multiuser OFDM multiband of UWB base station communication transmitter of claim 4 wherein said multiband spreading produces an orthogonal sequence for each of ~~multi-frequency~~ bands.

Claim 6 (currently amended): The MIMO-based multiuser OFDM multiband of UWB base station communication transmitter of claim 5 wherein signals of ~~multi-frequency~~ bands are orthogonal each other.

Claim 7 (currently amended): The MIMO-based multiuser OFDM multiband of UWB base station communication transmitter of claim 1 wherein said MIMO-based multiband modulation and multicarrier RF unit further includes ~~eleven~~ k multiband modulations, ~~eleven k~~ additions[[,]] ~~and eleven~~ followed by k analog bandpass filters, and each of the k multiband modulations coupled to all of the k additions, where k is an integer and greater than 1.

Claim 8 (currently amended): The MIMO-based multiuser OFDM multiband of UWB base station communication transmitter of claim 7 wherein the ~~eleven~~ k multiband modulations equivalently contain one of the modulations including binary phase-shifted keying (BPSK), quadrature phase-shifted keying (QPSK) or 16-ary quadrature-amplitude-modulation (16-QAM).

Claim 9 (currently amended): The MIMO-based multiuser OFDM multiband of UWB base station communication transmitter of claim 1 wherein said ~~multiple antenna unit~~ MIMO-based multiband and multicarrier RF unit coupled to said k antennas ~~[[may]]~~ is used to either enhance UWB signals quality and\or increase UWB transmitting distance.

Claim 10 (currently amended): The MIMO-based multiuser OFDM multiband of UWB base station communication transmitter of claim ~~[[1]]~~ 4 wherein each of said ~~multiple antenna unit includes eleven independent antennas~~ multiband spreading has two outputs producing two exact sequences.

Claim 11 (currently amended): A multiple-input multiple-output (MIMO)-based multiuser orthogonal frequency division multiplex (OFDM) multiband of ultra wideband (UWB) mobile communication receiver comprising:

~~[[an]]~~ two antennas unit;

a two-antenna based multiband radio frequency (RF) receiver unit;

said two-antenna based multiband RF receiver unit coupled to a combination section ~~[[of]]~~ including an

analog-to-digital (A/D) unit, [[and]] a digital receiver filter unit, and a multiband-despreading unit;

said A/D unit further including 2k A/D converters with the same sampling rate and resolution, where k is an integer and greater than 1;

said digital receiver filter unit further having 2k digital receiver filters;

said 2k A/D converters coupled to 2k digital receiver filters;

said multiband-despreading unit further comprising k multiband spreading;

each of said k multiband spreading spreads out two outputs of the said digital receiver filters via two exclusive-OR (XOR) modules;

said combination section coupled to a time-domain equalizer (TEQ) unit, which is M inputs and outputs where M is an integer and greater than 1;

said TEQ unit coupled to k serial-to-parallel (S/P) followed by k guard removings that are connected to k fast Fourier transforms (FFTs);

each of said k FFTs having 2N inputs, N outputs, N disable-point, where N is an integer and greater than 1;

said k FFTs coupled to k frequency-domain equalizer (FEQ) units that are connected with k parallel-to-serial (P/S);

each of said FEQ units further including Q equalizers, Q decision detectors, Q subtractors, and an adaptive algorithm, where Q is an integer and greater than 1;

a TEQ, FFT and FEQ section;

said k P/S coupled to a polyphase-based
demultiband; and

said polyphase-based demultiband coupled to a
despreading, deinterleaver, and decoding ~~section~~ unit.

Claim 12 (currently amended): The MIMO-based multiuser OFDM multiband of UWB mobile communication receiver of claim 11 wherein said ~~antenna unit contains two independent and identical antennas~~ 2k digital receiver filters have the same magnitude response and linear phase with the same number of filter coefficients, where k is an integer and greater than 1.

Claim 13 (currently amended): The MIMO-based multiuser OFDM multiband of UWB mobile communication receiver of claim 11 wherein said two-antenna based multiband RF receiver unit further includes two low-noise amplifier (LNA), two automatic gain control (AGC), two analog bandpass filters, an addition, eleven multiband down converters and demodulations.

Claim 14 (currently amended): The MIMO-based multiuser OFDM multiband of UWB mobile communication receiver of claim 11 wherein said ~~[[the]]~~ k multiband despreading ~~produces~~ generate ~~[[a]]~~ k unique ~~[[and]]~~ but different orthogonal despreading sequences for each of the ~~multi-~~ frequency bands, where k is an integer and greater than 1.

Claim 15 (currently amended): The MIMO-based multiuser OFDM multiband of UWB mobile communication receiver of claim 11 wherein said polyphase-based demultiband further

includes a random access memory (RAM) memory bank with a length size of N , and P parallel RAM memory banks with a length size of N/P , where N and P are integers and greater than 1 and N/P is an integer.

Claim 16 (currently amended): The MIMO-based multiuser OFDM multiband of UWB mobile communication receiver of claim 15 wherein said polyphase-based demultiband produces a serial output sequence with a data rate of N from P parallel input sequences with a data rate of N/P , where N and P are integers and greater than 1 and N/P is an integer.

Claim 17 (currently amended): A multiple-input multiple-output (MIMO)-based multiuser orthogonal frequency division multiplex (OFDM) multiband of ultra wideband (UWB) communication system comprising: ~~comprises a MIMO-based multiuser OFDM multiband of UWB base station communication transmitter and receiver, and N users of the MIMO-based OFDM multiband of UWB mobile communication transmitters and receivers;~~

a MIMO-based multiuser OFDM multiband of UWB base station communication transmitter and receiver;

said MIMO-based multiuser OFDM multiband of UWB base station communication transmitter and receiver having N base station antennas, where N is an integer and greater than 1;

said N base station antennas are controllable;

said MIMO-based multiuser OFDM multiband of UWB base station communication transmitter and receiver coupled to an UWB network interface unit;

said UWB network interface unit coupled to an UWB network;

P MIMO-based OFDM multiband of UWB mobile communication transmitters and receivers, where P is an integer and greater than 1;

each of said P MIMO-based OFDM multiband of UWB mobile communication transmitters and receivers having Q mobile station antennas, where Q is an integer and greater than 1;

said Q mobile station antennas are controllable;
the number of said N base station antennas is greater than the number of said Q mobile station antennas;
and

said P MIMO-based OFDM multiband of UWB mobile communication transmitters and receivers communicate with said MIMO-based multiuser OFDM multiband of UWB base station communication transmitter and receiver via a MIMO channel link.

Claim 18 (currently amended): The MIMO-based multiuser OFDM multiband of UWB communication system of claim 17 wherein said N base station antennas of the MIMO-based multiuser OFDM multiband of UWB base station communication transmitter and receiver ~~has eleven independent and identical antennas for eleven multi-frequency bands with a~~ are programmable [[use]]; where N is an integer and greater than 1.

Claim 19 (currently amended): The MIMO-based multiuser OFDM multiband of UWB communication system of claim [[18]] 17 wherein the fourth and/or fifth base station antenna

[[may]] can be turned off avoiding [[a]] interference with wireless local area network (WLAN) ~~802.11a~~ devices.

Claim 20 (currently amended): The MIMO-based multiuser OFDM multiband of UWB communication system of claim 17 wherein said Q mobile station antennas of each of the MIMO-based OFDM multiband of UWB mobile communication transmitters and receivers ~~employs two~~ are independent, [[and]] identical and programmable antennas, where Q is an integer and greater than 1.